Prioritizing ESPAM Improvements
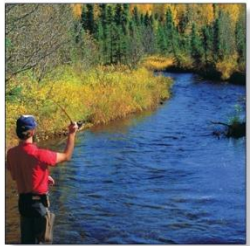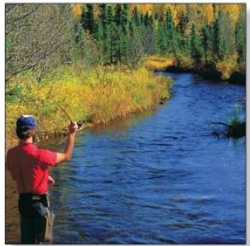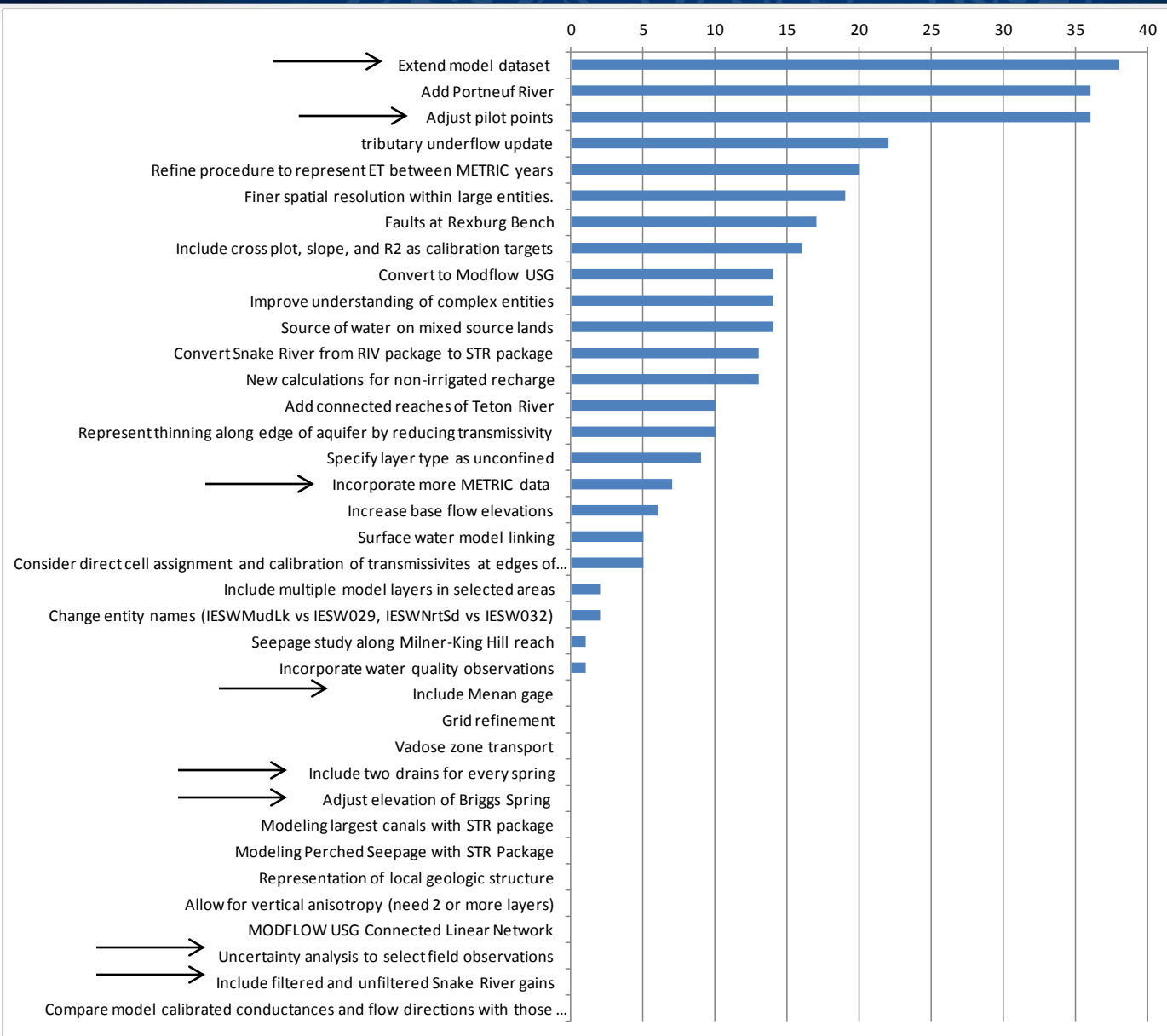
Allan Wylie IDWR

25 January 2017

Outline

- Compile suggested improvements
- Obtain ESHMC feedback
  - Rankings by committee members
- Assign scores to rankings
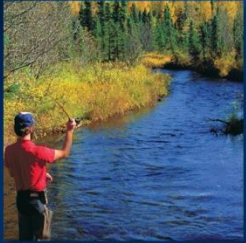- Recommendation to ESHMC

Compile and score feedback

- Sent list of potential improvement to ESHMC

- Everyone could vote for 10 items and rank them from 1-10, with 1 being the highest ranking

- Improvements that IDWR was going to do regardless of the voting were clearly identified

  - Extend dataset, include Menan gage, incorporate more METRIC data, etc

Extend model dataset
Add Portneuf River
Adjust pilot points
tributary underflow update
Refine procedure to represent ET between METRIC years
Finer spatial resolution within large entities.
Faults at Rexburg Bench
Include cross plot, slope, and R2 as calibration targets
Convert to Modflow USG
Improve understanding of complex entities
Source of water on mixed source lands
Convert Snake River from RIV package to STR package
New calculations for non-irrigated recharge
Add connected reaches of Teton River
Represent thinning along edge of aquifer by reducing transmissivity
Specify layer type as unconfined
Incorporate more METRIC data
Increase base flow elevations
Surface water model linking
Consider direct cell assignment and calibration of transmissivites at edges of...
Include multiple model layers in selected areas
Change entity names (IESWMudLk vs IESW029, IESWNrtSd vs IESW032)
Seepage study along Milner-King Hill reach
Incorporate water quality observations
Include Menan gage
Grid refinement
Vadose zone transport
Include two drains for every spring
Adjust elevation of Briggs Spring
Modeling largest canals with STR package
Modeling Perched Seepage with STR Package
Representation of local geologic structure
Allow for vertical anisotropy (need 2 or more layers)
MODFLOW USG Connected Linear Network
Uncertainty analysis to select field observations
Include filtered and unfiltered Snake River gains
Compare model calibrated conductances and flow directions with those ...

Recommendation

- IDWR pursue all low effort recommendations on the list with a bias toward higher ranking recommendations
- Resource intensive updates should come from recommendations that scored higher

|	Prioritized improvements to ESPAM2.2		
	Task	**Level of Effort**	**Comments**
1	Model the Portneuf River as connected to the ESPA aquifer	moderate	Will include the reach between the gage at Edson Fichter Park and the upper end of American Falls Reservoir, and will include the USGS gages at Pocatello and near Tyhee. The reach gain calculation is somewhat complex.
2	Include the Snake River USGS gage near Menan, ID as a model calibration target	easy	Data already entered into next draft model version (ESPAM2.2)
3	Include two drains in every cell where springs discharge along the western model	easy	Modification already built into draft version of ESPAM2.2.
4	Adjust the drain elevation in the model cell reprsenting Briggs Spring	easy	Drain cell already modified in draft version of ESPAM2.2
5	Include filtered and unfiltered Snake River gains	moderate	Filtered data already entered into draft version of ESPAM2.2; evaluation of spikes and data ouliers in
6	Extend model dataset	easy	Model period will increase approximately 5 years from 2008 through the 2013 irrigation season.
7	Incorporate more Metric data	easy	ET results for 2010, 2011, and 2013 and possibly 1986 and 1992 will be included in ESPAM2.2.
8	Adjust pilot points	easy	
9	Improve understanding and finer spatial resolution of complex irrigation entities	moderate	Refined data for AFRD2/Big Wood Canal Company Service area already entered into
10	Incorporate faults on Rexburg Bench	easy	Hydrologic significance of the faults is uncertain.
11	Include cross plot, slope, and R^2 as calibration targets	moderate	
12	Change names of irrigation entities	easy	
13	Add Teton River as connected to the ESPA aquifer	easy	May not be feasible without field data
14	Direct cell assignment and calibration of transmissivity at edges of model domain	easy	No indication of benefit from results to date.
	Prioritized improvedments in developing ESPAM3.0 - projected to be completed in three to five years		
	Task	**Level of Effort**	**Comments**
1	Convert to Modflow USG	easy	The conversion will be easy assuming we retain the uniform 1 mile x 1 mile grid. Will require significant committee review and discussion
2	Convert to an unconfined representation of the ESPA	moderately difficult	Will require significant committee review and discussion
3	Refine procedure to represent ET between METRIC years	moderately difficult	Will require significant effort to process other data (e.g, NDVI, other satellite imagery).
4	New calculations for non-irrigated recharge	unknown	Approach and algorithms need to be develolped and requires committee review and discussion.
5	Source of water on mixed source lnads	difficult	Significant unknowns.

IDWR Order of Incorporation

Priority	#	Task	Level of Effort	Comments
6	1	Model the Portneuf River as connected to the ESPA aquifer	moderate	Will include the reach between the gage at Edson Fichter Park and the upper end of American Falls Reservoir, and will include the USGS gages at Pocatello and near Tyhee. The reach gain calculation is somewhat complex.
3	2	Include the Snake River USGS gage near Menan, ID as a model calibration target	easy	Data already entered into next draft model version (ESPAM2.2)
2	3	Include two drains in every cell where springs discharge along the western model	easy	Modification already built into draft version of ESPAM2.2.
2	4	Adjust the drain elevation in the model cell reprsenting Briggs Spring	easy	Drain cell already modified in draft version of ESPAM2.2
3	5	Include filtered and unfiltered Snake River gains	moderate	Filtered data already entered into draft version of ESPAM2.2; evaluation of spikes and data ouliers in
	6	Extend model dataset	easy	Model period will increase approximately 5 years from 2008 through the 2013 irrigation season.
	7	Incorporate more Metric data	easy	ET results for 2010, 2011, and 2013 and possibly 1986 and 1992 will be included in ESPAM2.2.
5	8	Adjust pilot points	easy	
4	9	Improve understanding and finer spatial resolution of complex irrigation entities	moderate	Refined data for AFRD2/Big Wood Canal Company Service area already entered into
	10	Incorporate faults on Rexburg Bench	easy	Hydrologic significance of the faults is uncertain.
	11	Include cross plot, slope, and R^2 as calibration targets	moderate	
	12	Change names of irrigation entities	easy	
	13	Add Teton River as connected to the ESPA aquifer	easy	May not be feasible without field data
	14	Direct cell assignment and calibration of transmissivity at edges of model domain	easy	No indication of benefit from results to date.

Prioritized improvedments in developing ESPAM3.0 - projected to be completed in three to five years

| Priority	#	Task	Level of Effort	Comments
1	1	Convert to Modflow USG	easy	The conversion will be easy assuming we retain the uniform 1 mile x 1 mile grid. Will require significant committee review and discussion
	2	Convert to an unconfined representation of the ESPA	moderately difficult	Will require significant committee review and discussion
	3	Refine procedure to represent ET between METRIC years	moderately difficult	Will require significant effort to process other data (e.g, NDVI, other satellite imagery).
	4	New calculations for non-irrigated recharge	unknown	Approach and algorithms need to be develolped and requires committee review and discussion.
	5	Source of water on mixed source Inads	difficult	Significant unknowns.
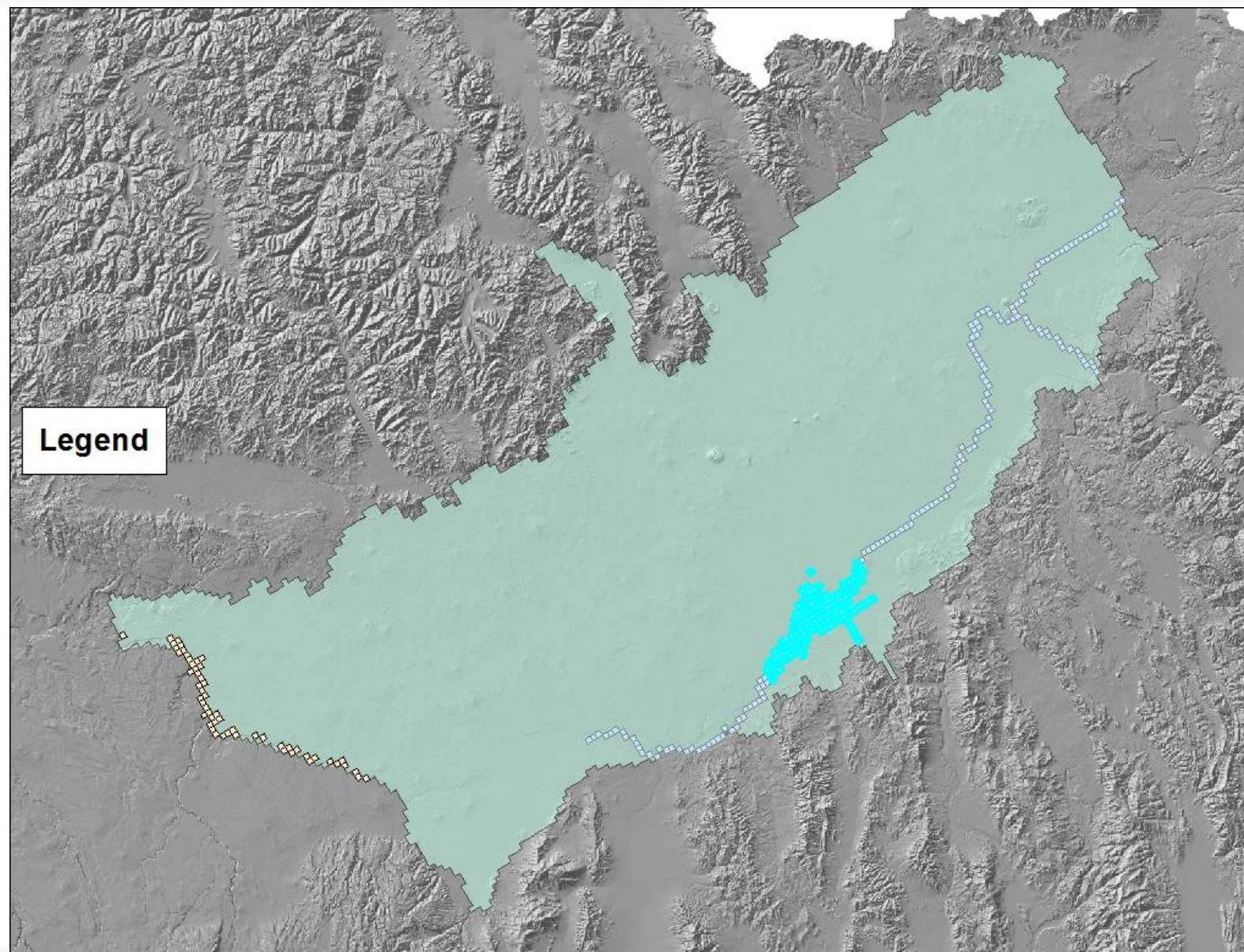
Legend

Portneuff River
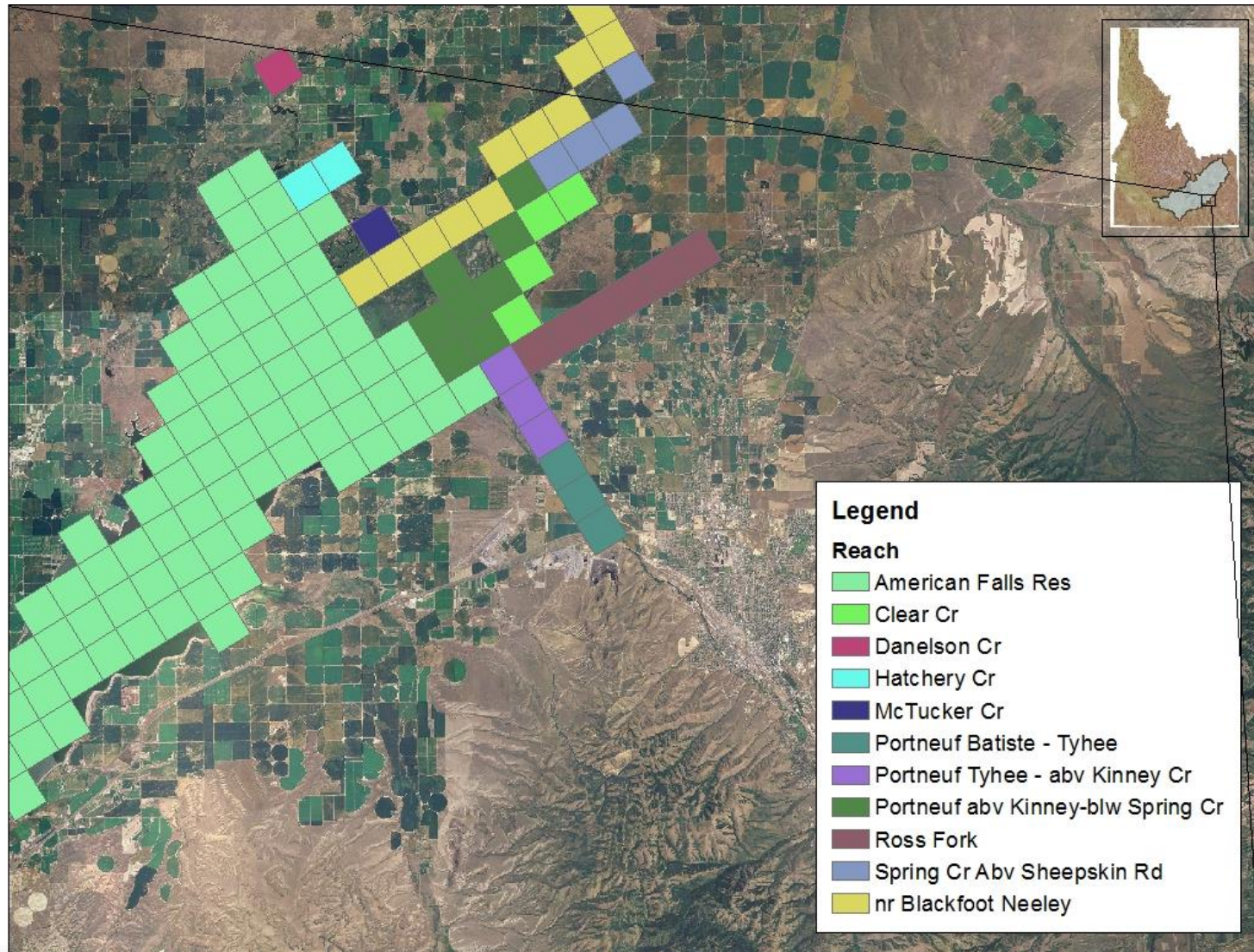
nr Blackfoot to Neeley Unfiltered Gains
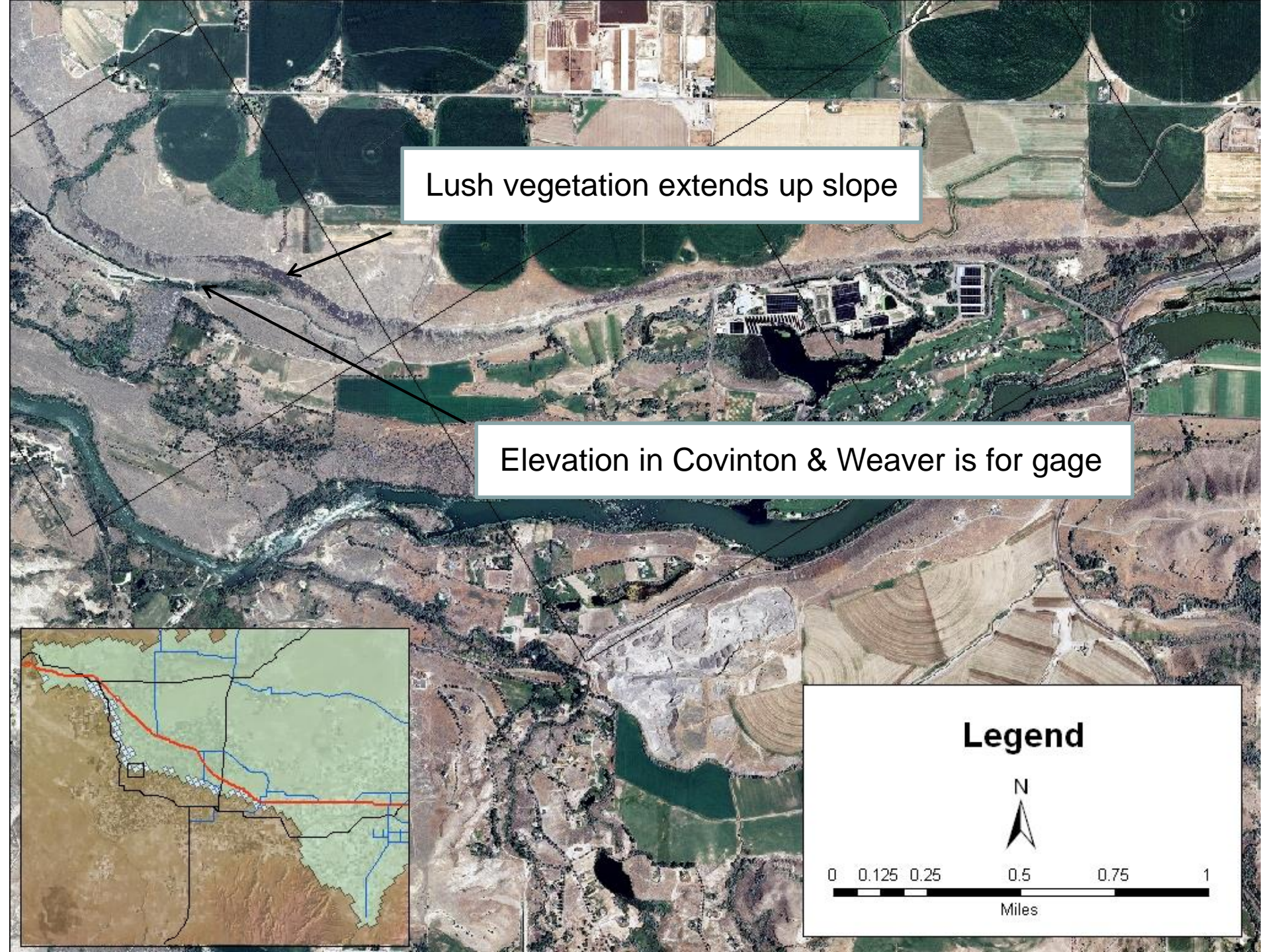Calibration Period (May 1985 - Sep 2008)
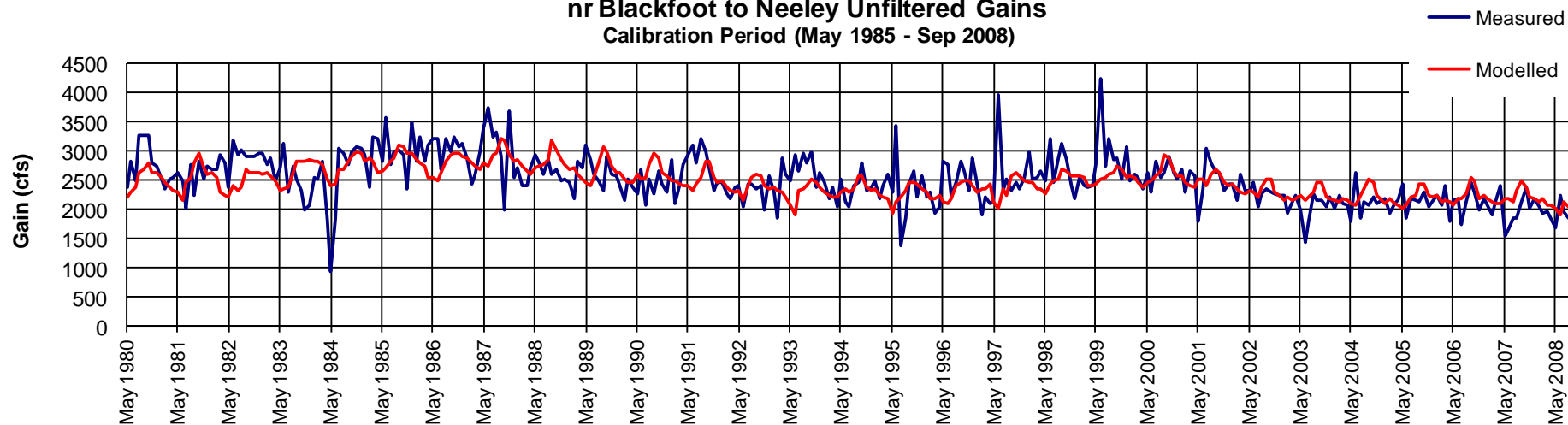
— Measured
— Modelled

nr Blackfoot to Neeley Filtered Gains
Calibration Period (May 1985 - Sep 2008)

— Filtered Measured
— Filtered Modeled

Legend
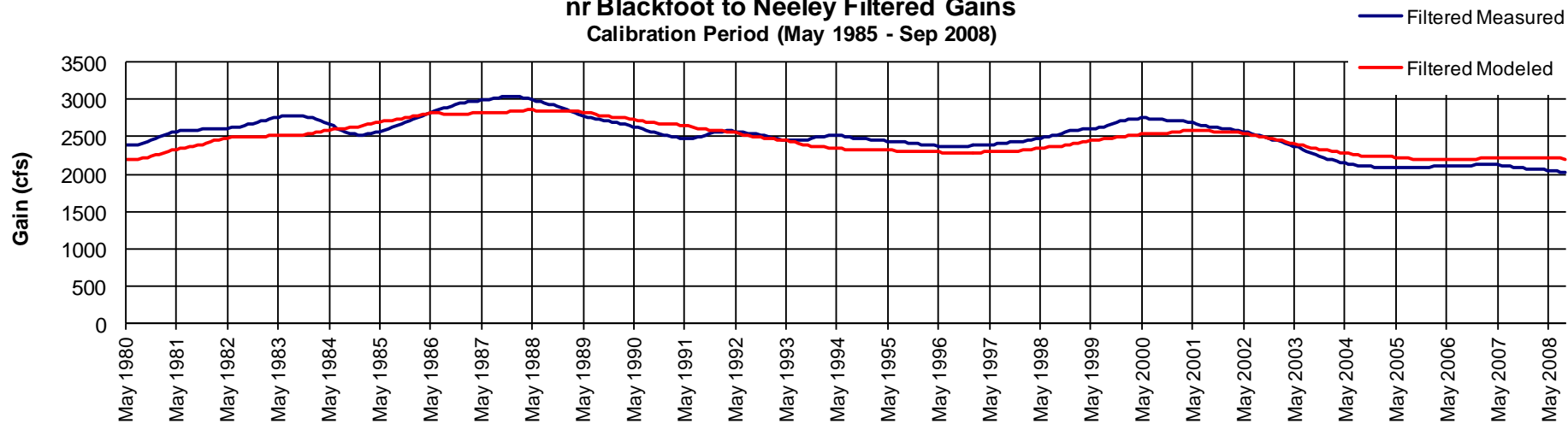
Adjust Elevation of Briggs Sp

- Elevation of Briggs is for the USGS gauge

- Spring emerges at a higher elevation

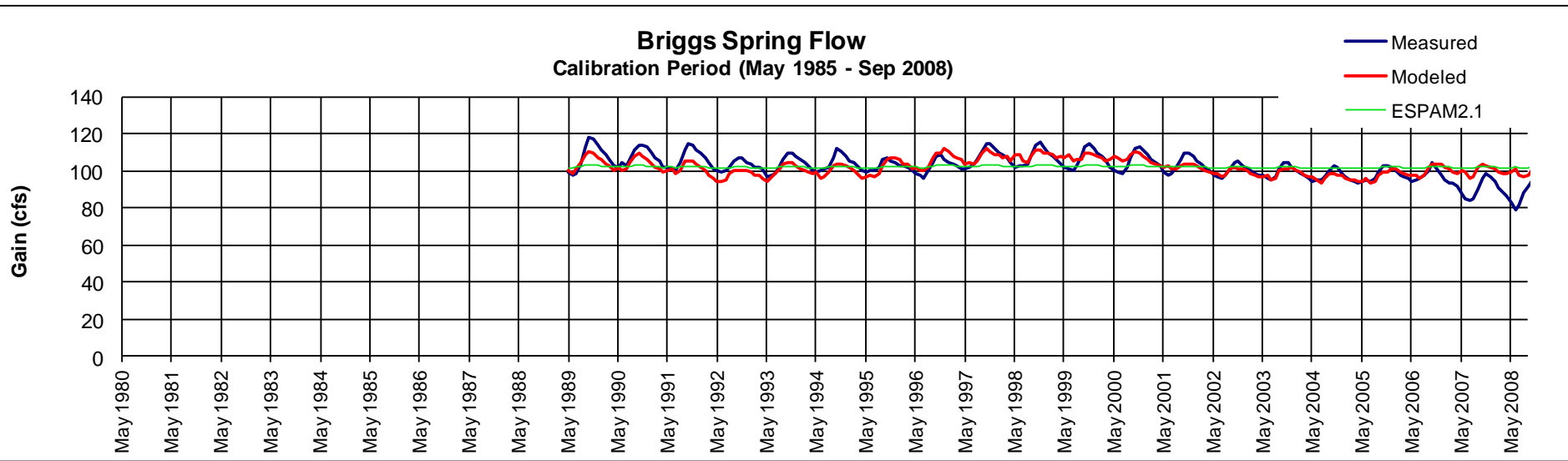- Higher elevation will allow model to replicate observed seasonal variation

Lush vegetation extends up slope

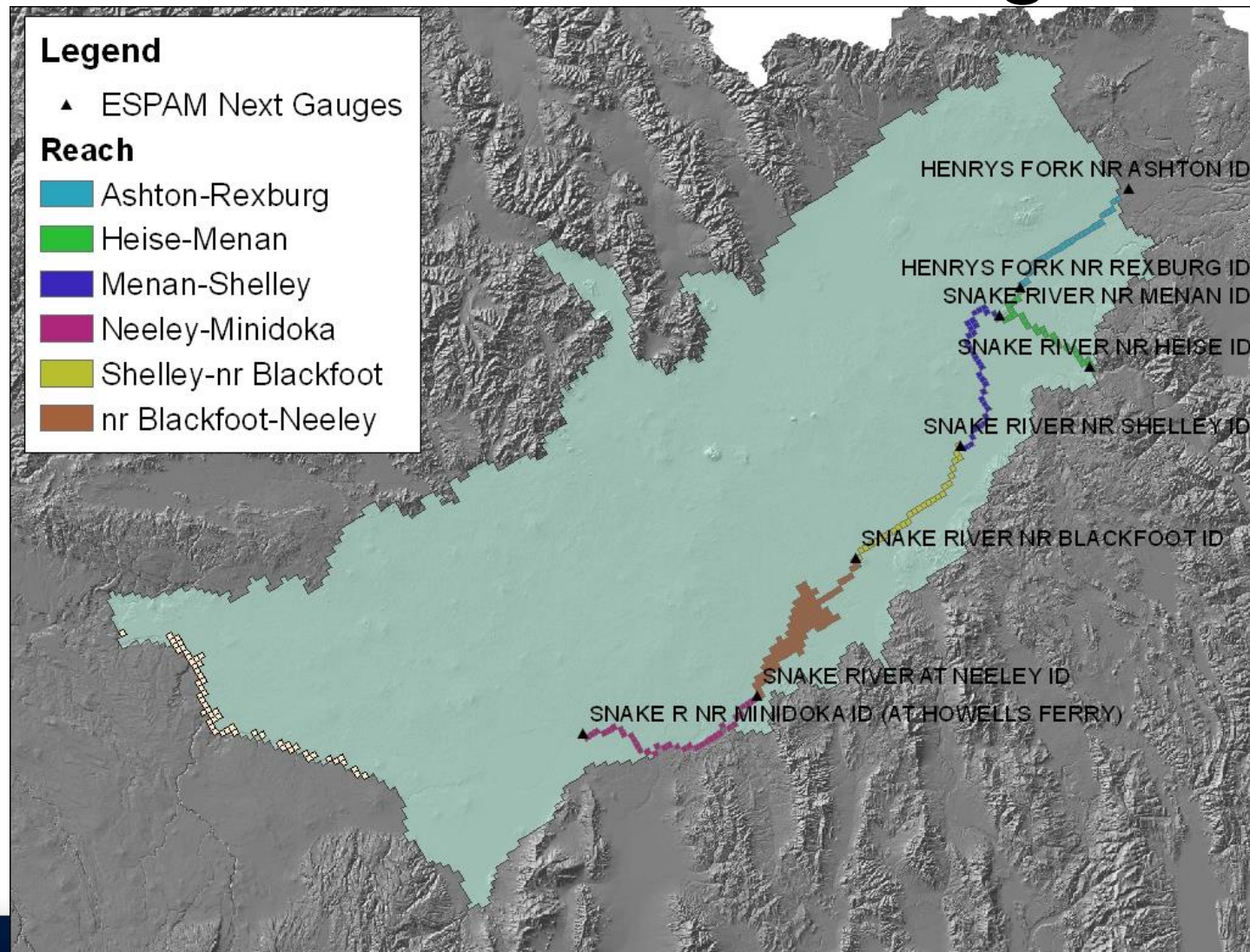Elevation in Covinton & Weaver is for gage

Legend

N

0   0.125 0.25   0.5   0.75   1
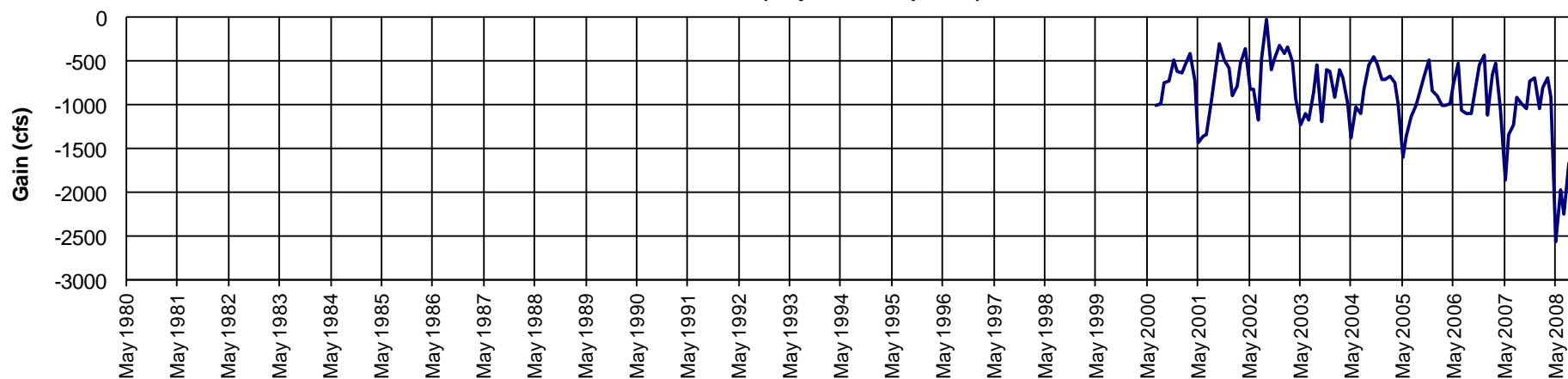Miles
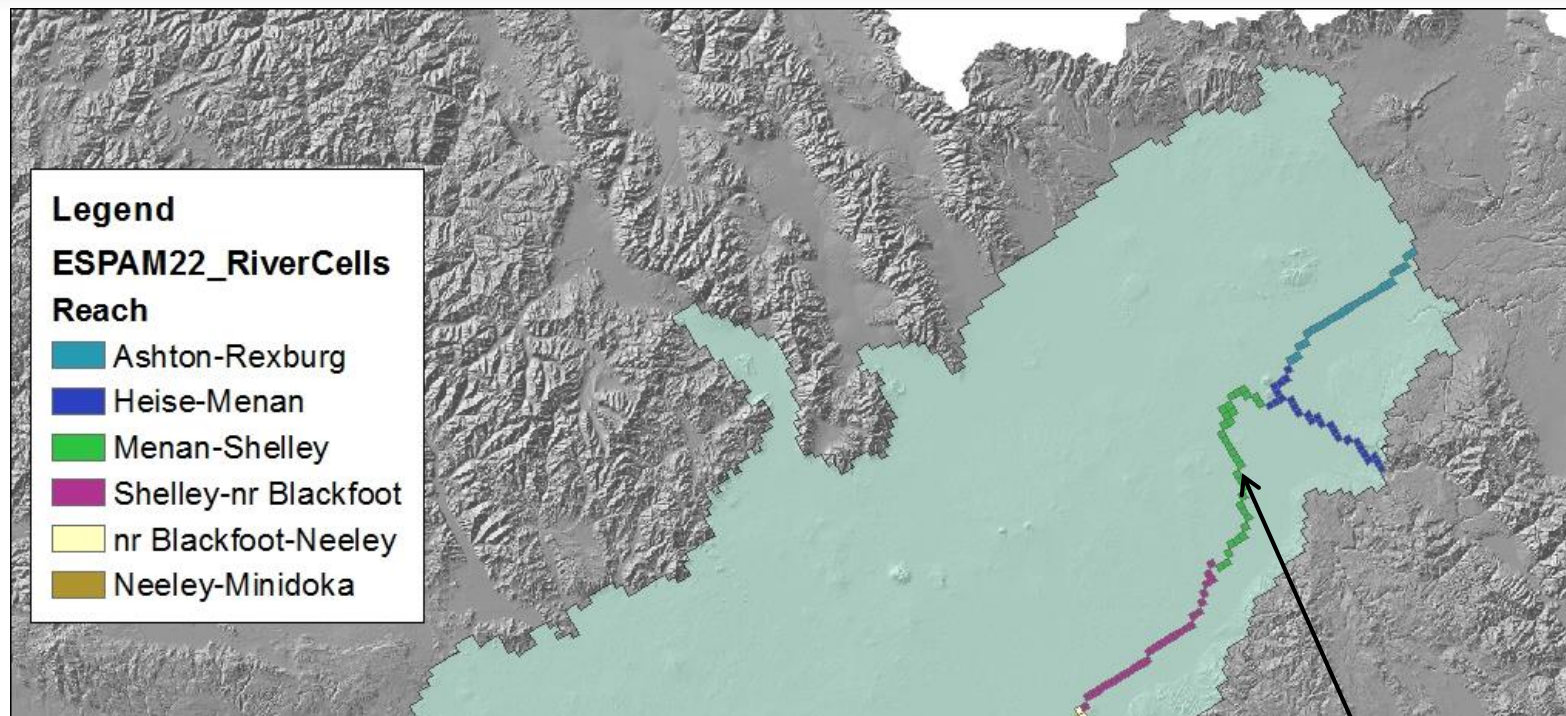
Adjust Elevation of Briggs Sp
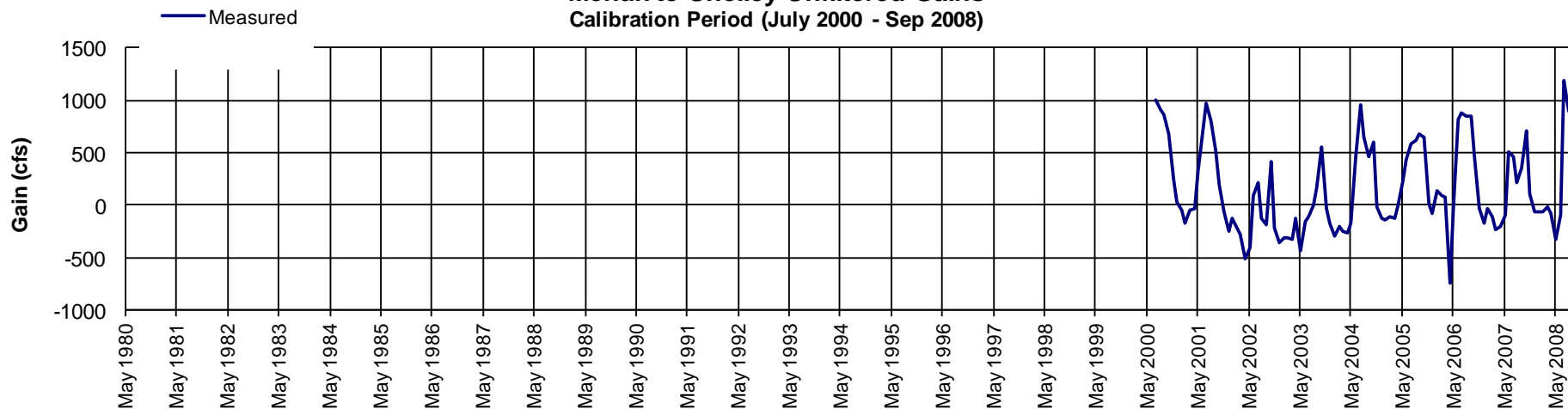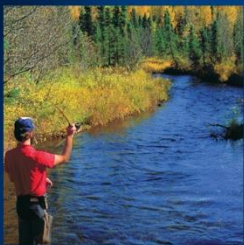
Include Menan Gage

Legend

ESPAM22_RiverCells

Reach

- Ashton-Rexburg
- Heise-Menan
- Menan-Shelley
- Shelley-nr Blackfoot
- nr Blackfoot-Neeley
- Neeley-Minidoka

Heise to Menan Unfiltered Gains
Calibration Period (July 2000 - Sep 2008)

— Measured

Legend

ESPAM22_RiverCells

Reach

- Ashton-Rexburg
- Heise-Menan
- Menan-Shelley
- Shelley-nr Blackfoot
- nr Blackfoot-Neeley
- Neeley-Minidoka

Menan to Shelley Unfiltered Gains
Calibration Period (July 2000 - Sep 2008)

Measured

End